DOCUMENT REQUIREMENTS LIST

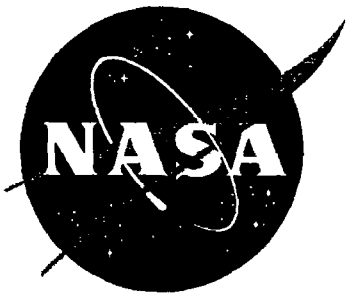
FOR THE

MICROWAVE LIMB SOUNDER

(MLS)

EOS CHEMISTRY PROJECT

MAY 26, 1998



GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

GSFC 424-28-24-03

DOCUMENT REQUIREMENTS LIST

FOR THE

MICROWAVE LIMB SOUNDER

(MLS)

EOS CHEMISTRY PROJECT

May 26, 1998

DOCUMENT REQUIREMENTS LIST

MLS INSTRUMENT

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GSFC - Code 424

6/17/98
Date

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TABLE OF CONTENTS

ACRONYM LISTING

ACRONYM	DEFINITION
CAGE	Commercial and Government Entity
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CIL	Critical Item List
CMO	Configuration Management Officer
CMP	Configuration Management Plan
DID	Data Item Description
DOD	Department of Defense
DOF	Degree of Freedom
DPA	Destructive Physical Analysis
DPM	Deputy Project Manager
DRD	Description of Required Data
DRL	Documentation Requirements List
EAR	Engineering Analysis Reports
EM	Engineering Model
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interface
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESD	Electrostatic Discharge
FAR	Federal Acquisition Regulation
FEM	Finite Element Model
FM	Flight Model
FMEA	Failure Modes and Effects Analysis
FOV	Field-of-View
GEVS	General Environmental Verification Specification
GFE	Government Furnished Equipment
GFP	Government Furnished Property
GHB	Goddard Handbook
GIDEP	Government-Industry Data Exchange Program
GIIS	General Instrument Interface Specification
GSFC	Goddard Space Flight Center
IGSE	Instrument Ground Support Equipment
MLS	Microwave Limb Sounder
MOCR	Mission Operations Change Request
MOR	Mission Operations Review
MRB	Material Review Board
NASA	National Aeronautics and Space Administration
NHB	NASA Handbook
NSPAR	Non-standard Part Approval Request
OHA	Operations Hazard Analysis
PA	Performance Assurance
PAIP	Performance Assurance Implementation Plan
PAR	Performance Assurance Requirements
PDR	Preliminary Design Review
PERT	Program Evaluation and Review Technique
PFM	Protoflight Model
PMS	Performance Measurement System

PMSR..... Performance Measurement Status Report
PPL..... Preferred Parts List
PER..... Pre-Environmental Review
PSR..... Pre-Shipment Review
PVPR..... Performance Verification Peer Review
QA..... Quality Assurance
RFP..... Request for Proposal
SCR..... System Concept Review
SMAP..... Software Management and Assurance Program
SNR..... Signal Noise Ratio
SOW..... Statement of Work
STE..... System Test Equipment
SWAR..... Software Acceptance Review
SWTRR..... Software Test Readiness Review
TES..... Tropospheric Emission Spectrometer
UIID..... Unique Instrument Interface Document
WBS..... Work Breakdown Structure

DOCUMENTATION REQUIREMENTS LIST FOR THE MLS INSTRUMENT

Part A - Introduction, Definitions, and Distribution Instructions

1. Introduction

This document defines the requirements for deliverable documentation to be provided by the JPL MLS Project. Part A includes the introduction, definitions, and instructions for mailing and/or distribution. Part B presents the Documentation Requirements List (DRL) item by item, with due dates, quantity, and distribution key. Part C provides a description of each item and describes use, preparation information, etc. Except where specifically indicated to the contrary, the formats and drawing standards used shall be those normally used by the MLS JPL team and/or by its subcontractors.

This DRL is associated with two agreements – the Flight Working Agreement and the MLS Science and Flight Operations Working Agreement. DRL items numbered below 600 are applicable to the Instrument Agreement, and DRL items numbered 600 and above are applicable to the Science Agreement.

JPL may substitute a combination of existing and new documents to satisfy DRL delivery requirements if all pertinent information called out in the deliverable is included, and if the substitution has bilateral agreement between JPL and GSFC.

2. Definition of Due Dates/Maturity

The following definitions apply to the Due Date, Maturity column in Part B:

a Due Date

PDR, CDR, CPR, etc.: Preliminary Design Review, Critical Design Review, Calibration Peer Review, etc. Documentation received 10 working days prior to review, unless otherwise stated.

As Generated: After each initial edition, revision, addition, etc. Items that are critical to schedule, performance, or interface shall be transmitted to GSFC within 48 hours of generation.

Monthly: with monthly status reports

Weekly: with weekly status reports

L: Launch Date

b. Maturity

Preliminary: The initial submission of an item. To be completed as is practicable at the time of preparation. TBDs are acceptable.

Final: The complete thorough submission of an item for approval, review, or information. All TBDs must be resolved. This does not preclude updating at a later date. Any updates shall require the same approval/review process as was required for the previous submissions.

Current: The best up-to-date information available at the time

Other entries in the Due Date, Maturity column are self-explanatory.

3. Mailing and/or Distribution

The distribution addresses and quantities shall be as follows:

No. Of Copies	GSFC Addressee	Code
1	Technical Monitor	424
Balance	Configuration Mgmt Officer	424

One electronic copy in Microsoft Word shall also be sent to the Technical Monitor for all documents. Review data packages shall be accompanied by 50 copies of the corresponding review presentation.

4. Definition of Categories

The following definitions apply to Submission Category column in Part B·

A. Approval - Documents in this category require written GSFC approval prior to use. Receipts by GSFC shall occur within the time specified in the due date column of Part B of this document. Requirements for resubmission shall be as specified in letters(s) of disapproval. GSFC response shall occur within 30 days of document receipt unless otherwise specified in the document item description. GSFC approval is required for a single document to be delivered via multiple documents. If GFSC concurs with the multiple documents for a single item, approval will be given for each submission, and GSFC response shall occur within 30 days of individual submission receipt. If GSFC response is not received within this time frame, approval shall be assumed by the JPL Project.

R. Review - Documents in this category require receipt by GSFC prior to use and within the time period specified in the Working Agreement. They are subject to evaluation by GSFC or its designated representatives to determine JPL Project effectiveness in meeting Working Agreement objectives. When government evaluations reveal inadequacies, corrections to the documents shall be negotiated between GSFC and the JPL Project.

I. Information - Documents in this category require receipt by GSFC within the time period specified in the Working Agreement for the purpose of determining current program status, progress, and future planning requirements.

Deliverable Requirements List
MLS Instrument Phase C/D SOW
Instrument Deliverables

Part B - Documentation Listing

O. Plans and Review Data Packages (0XX Series)

	ITEM	DUE	QTY	SUB CAT
001	Reserved			
002	Reserved			
003	Reserved			
004	Reserved			
005	Reserved			
006	Reserved			
007	Reserved			
008	Software Management Plan	SCR, final	3	R
009	Reserved			
010	Reserved			
011	Reserved			
012	Reserved			
013	Reserved			
014	Reserved			
015	Reserved			
016	Preliminary Design Review (PDR) Data Package	PDR, final	1	I
017	Reserved			
018	Calibration Plan	PDR, prelim CDR, final	3 3	R R
019	Reserved			
020	Critical Design Review	CDR, final	1	I

	(CDR) Data Package			
021	Reserved			
022	Performance Verification Plan	CDR, final	3	R
023	Contamination Control Plan	CDR, final	3	A
024	Reserved			
025	Reserved			
026	Reserved			
027	Reserved			
028	Reserved			
029	Pre-Environmental Review (PER) Data Package	PER, final	1	I
030	Reserved			
031	Reserved			
032	Pre-Ship Review (PSR) Data Package	PSR, final	1	I

1. Math Models and Analyses (1XX Series)

101	Reserved			
102	Structural Math Model	PDR, prelim CDR, final	1 1	I I
103	Thermal Math Model	PDR, prelim CDR, final	1 1	I I
107	Operations Hazards Analysis	30 days prior to PSR	2	A

2. Engineering and Test Reports (2XX Series)

201	Reserved			
202	Reserved			
203	Reserved			
204	Reserved			

205	Reserved			
206	Reserved			
207	Reserved			
208	Reserved			
209	Malfunction/Failure Reports	Pre instrument integration Post instrument integration	1 1	I A
210	Reserved			
211	Reserved			
212	Reserved			
213	Reserved			
214	Reserved			
215	Reserved			
216	Reserved			
217	Reserved			
218	Reserved			
219	Reserved			
220	Reserved			
221	Reserved			
222	Reserved			
223	Reserved			
224	Safety Compliance Data Package	PDR, preliminary CDR, update PSR, final	1 1 1	R A A

3. Specification and Operation (3XX Series)

303	Command and Telemetry Handbook	PDR, update CDR, final	3 3	I I
302	Reserved			
303	Reserved			
304	Reserved			

305	Reserved			
306	Reserved			
307	Operation and Maintenance Manuals	PSR, final	3	I
308	Performance Verification Specification	CDR, final	3	R
4.	Procedures (4XX Series)			
401	Reserved			
402	Reserved			
403	Reserved			
404	Reserved			
405	General Operating Command Procedures	PSR, final	3	I
406	Transportation and Handling Procedures	30 days prior to use	3	I
5.	Miscellaneous (5XX Series)			
501	Project Management Monthly Report		3	I
502	Reserved			
503	Reserved			
504	Reserved			
505	Reserved			
506	Reserved			
507	Reserved			
508	Reserved			
509	Reserved			
510	Waiver/Deviation Requests (Class 1)	As generated, final	1	A
511	Reserved			
512	Configuration Change	As generated, final	1	A

	Requests (Class 1)				
513	Reserved				
514	Reserved				
515	Reserved				
516	Reserved				
517	Reserved				
518	Reserved				
519	Reserved				
520	Reserved				
521	Reserved				
522	Photographic Records	As generated	2	I	
523	Reserved				
524	Reserved				
525	Reserved				
526	Acceptance Data Package	Delivery, final	15	A	
6.	Science Software (6XX Series)				
601	Algorithm Theoretical Basis Document	Dec., 1998, review draft ATBD Review + 3 months, final	3	A 3	 A
602	Reserved				
603	Reserved				
604	Science Data Validation Plan	C/D start + 12 months, final	3	R	
605	Scientific Publications	As generated	3	I	
606	Science Requirements Document	C/D start + 6 months, final	3	I	
607	Reserved				
608	Science Data Management Plan	C/D start + 12 months, final	3	R	
609	Instrument Operations Support Plan	PDR, prelim CDR, final	3 3	I R	
610	SCF Plan	C/D start + 12 months, final	3	R	

DESCRIPTION OF REQUIRED DATA

1. Title:	2. DRL No.:
SOFTWARE MANAGEMENT PLAN	008

3. References:

EOS Chemistry and Special Flights Instrument Software Management Requirements Document (424-28-11-01), Para. 4.1.1, Table 4-1, Appendix A

4. Use:

Provides all software planning information for the system including both flight software and science software. Software planning for management, assurance, and development for all life-cycle phases for the system including sustaining engineering.

5. Related Documents:

N/A

6. Preparation Information:

One document shall be prepared that addresses the requirements of EOS Chemistry and Special Flights Instrument Software Management Requirements Document (424-28-11-01) for flight and science software, and addresses the following (referenced to subsections of NASA-DID-M000):

a. Software Development Plan	NASA-DID-M200
b. Sustaining Engineering and Operations Plan	NASA-DID-M300
c. Assurance Plan	NASA-DID-M400
d. Software Integration and Test Plan	NASA-DID-M400
e. Software Acceptance Test Plan	NASA-DID-M400
f. Risk Management Plan	NASA-DID-M500
g. Software Configuration Management Plan	NASA-DID-M600
h. Delivery and Operations Transition Plan	NASA-DID-M700

The science software section shall address software used to produce standard data products and any special data products to be distributed or archived at the DAAC, and will include the following topics:

a. Description of the software to be. Description of the overall tasks related to data production software that will reside in the DAAC and in the SCF;

b. organization of the team, roles and responsibilities of each Co-I, the data production software development and maintenance activities that each Co-I will perform, and their participation in operations shall be determined by the PI and provided to JPL;

c. the work breakdown structure for the different kinds of work activities required in software development and maintenance or the name of the document where this information is located;

d. description of the software integration and test (I&T) approach at the SCF;

e. description of data production software maintenance activities and control of changes including assigned responsibilities;

f. description of the techniques that will be used to estimate the computing resources required for the data production software;

g. description of the data production software life-cycle. It will specifically address the approach, identifying the software implementation and maintenance processes, technical reviews to be held and methods for assuring that the operational data production software will posses the following quality aspects: portability, maintainability, operability, reusability, and efficiency with respect to consumption of computing resources;

h. an integrated schedule, or its location, for the development and deliveries of software and for software validation, identifying major software design reviews, milestones, I&T, and operations requirements. The schedule will separately identify standard data product development and support for any special data product development if required by the PI;

i. approach to identification and mitigation of risks.

This shall be submitted in accordance with Part B of this document.

DESCRIPTION OF REQUIRED DATA

1. Title: PRELIMINARY DESIGN REVIEW (PDR) DATA PACKAGE

2. DRL No.: 016

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-?24-01), Para. 5.1
Science Requirements on the EOS MLS Instrument (JPL D-14421)
Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 2.2, 2.3
EOS Project Configuration Management Plan (420-02-02), Figure 3-1

4. Use:

Presents the Flight Equipment, software, IGSE design and operation, and S/C interface.

5. Related Documents:

DRL # 008, 018, 020, 022, 023, 032, 102, 103, 107, 303, 308, 510

6. Preparation Information:

The design review package shall be prepared in accordance with the MAR for TES and MLS (424-11-13-02), and shall include, as a minimum:

a. Agenda;
b. copies of responses to action items and recommendations generated at prior reviews;
c. presentation material (e.g., viewgraph copies) for the subject review;
d. analyses and reports required at the review; and
e. supportive material - Where supportive material has been submitted prior to or concurrent with this requirement, such material may be incorporated within this requirement by reference.

This data package shall also contain information to cover the instrument system and subsystem designs, including software and IGSE, including electrical, mechanical, optical, thermal, software, test, and interface aspects of the design configuration. This data package shall include, as applicable:

a. Performance Specification (subsystems and IGSE);
b. Block Diagram and Description of Operation (instrument and IGSE);
c. Software Descriptions both instrument based and external;
d. Schematic and Logic Diagrams (including waveforms, timing, and components);
e. Mechanical Configuration Drawings;
f. Interface Descriptions;
g. FMEA status/results;
h. Worst Case Analyses
   - Electrical Circuits
   - Mechanisms
   - Limited Life Items
   - Lubrication and Lubrication Loss
   - Tolerance and Tolerance Sensitivity Analysis (including thermal, optical, and mechanical considerations);
i. Stress Analyses;
j. Thermal Analysis;
k. EMI Considerations;
l. Weight and Power;
m. Reliability Analysis/Assessment;
n. Test Plan (including all Environmental Tests and Performance Verification);
o. Manufacturing Considerations;
p. Maintainability Considerations;
q. Materials and Lubrication List;
r. Summary of Deviations/Waivers;
s. Contamination Control and Monitoring Considerations;
t. Spares Program;
u. Limited Life Items List;
v. NSPAR Summary (number submitted/approval status);
w. System Safety Hazards Analyses
   - Hazards Identification Matrix
   - Single Point Failure Summaries
   - Risk Assessment Rationale;
x. Calibration Considerations;
y. Long Lead Procurement Items
z. Results of Test Bedding, Breadboard Testing, and software prototyping; and
aa. Potential descopes through CDR.

The action items with responses shall also be submitted.

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:	2. DRL No.:
CALIBRATION PLAN	018

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01)
Science Requirements on the EOS MLS Instrument (JPL D-14421)

EOS Calibration Management Plan (420-03-01), Para. 3, 3.1, 3.2

4. Use:

Controlling document for definition of calibration requirements, equipment and methods.

5. Related Documents:

DRL #016, 020, 022, 029

6. Preparation Information:

This Plan shall be prepared in accordance with the EOS Calibration Management Plan (420-03-01). It shall contain as a minimum the following:

- calibration approach
- calibration facilities
- calibration equipment
- pre-launch calibration
- instrument characterization activities
- on-orbit and vicarious calibration
- schedule
- planned implementation of long-term calibration and its incorporation into data products
- plans for archiving information related to calibration

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

CRITICAL DESIGN REVIEW (CDR) DATA PACKAGE

2. DRL No.:

020

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01), Para. 5.1
Science Requirements on the EOS MLS Instrument (JPL D-14421)
Mission Assurance Requirements for TES and MLS (424-11-13-02)
EOS Configuration Management Plan (420-02-02), Figure 3-1

4. Use:

Presents the Flight Equipment, software and IGSE design and operation and S/C interface aspects as evaluated since the PDR.

5. Related Documents:

DRL #008, 016, 018, 022, 023, 032, 102, 103, 107, 308, 406, 510

6. Preparation Information:

The design review package shall be prepared in accordance with the MAR for TES and MLS (424-11-13-02), and shall include, as a minimum:

a. Agenda;
b. copies of responses to action items and recommendations generated at prior reviews;
c. presentation material (e.g., viewgraph copies) for the subject review;
d. analyses and reports required at the review;
e. supportive material - Where supportive material has been submitted prior to or concurrent with this requirement, such material may be incorporated within this requirement by reference;
f. updates of items from PDR;
g. component specifications, designs, schematics, and diagrams;
h. design adequacy data (drawings, analyses, and testing plans);
i. parts and devices application review reports;
j. worst-case analysis;

k. FMEA;
l. EM system and subsystem functional and environmental test results;
m. Critical Items List (CIL); limited life items list;
n. single point failure summaries with risk acceptance rationale, component or interface level and above;
o. actions to control or eliminate identified system safety hazards
p. simulation/prototyping for software; and
q. potential descopes through PER.

The action items with responses shall also be submitted.

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title: PERFORMANCE VERIFICATION PLAN

2. DRL No.: 022

3. References:
Mission Assurance Requirements (MAR) for the TES and MLS (424-11-13-02), Para. 3.2.1, 3.2.2, 3.2.3
Documentation for Agreements Related to the MAR for MLS and TES, letter from EOS Chemistry Project Manager to the JPL Earth Science Flight Experiments Manager, dated April 9, 1998.

4. Use:

Provide overall view of the Performance Verification and Test Program, detailing test and analysis philosophy and objectives for the instrument.

5. Related Documents:

DRL #016, 020, 107, 308, 406,
EOS General Interface Requirements Document (422-12-11-02)
MLS Unique Instrument Interface Document (424-28-24-02)

6. Preparation Information:

This documentation shall be developed in accordance with the references above. It shall include:

Verification Program Objectives
Verification Program Philosophy
Verification Categories
Identification Of Detailed Verification Test Plans
Safety Considerations
Personnel Responsibilities
General Testing Guidelines
Facilities and Instrumentation
Interaction Of Test and Analysis
Rationale For Retest
End - To - End Testing
Control Of Unscheduled Activities During Verification
Procedures and Reports
Electrical Function Tests .
Discussion On Hierarchical Testing Philosophy
Electronic Fabrication and Assembly Testing
Limited Life Electrical Elements
Structural and Mechanical Test Requirements

Modal / Sine Survey
Random and Sine Vibration
Acoustics
Mechanical Shock
Mechanical Function
Life Testing
EMC / Magnetics Tests
EMC Analyses
Thermal-Vacuum, Qualification, and Flight Acceptance Testing
Thermal Balance
Thermal Cycling
Temperature/Humidity (Transportation and Storage)
Leakage
Identification Of Required Analyses
Mass Properties
Pressure Profile
Kinematic Analysis
Thermal Analysis
Verification Matrices – Science Requirements To Instrument Functional and Design Requirements, and Performance Requirements To Verification Level/Method, Environmental Requirements Matrix, Interface Requirements Matrix

Note: Lower level JPL plans and procedures shall be identified and made available on request for review that cover:

a) Descriptions of Functional Requirements
b) Qualification and Acceptance test plans with accept/reject criteria
c) Verification of redundant and cross strapped interfaces
d) Post-launch in-orbit verification
e) Performance parameters used for trending
f) Verification of previously flown hardware
g) Flight and Mission operations software validation plans

DESCRIPTION OF REQUIRED DATA

1. Title:

CONTAMINATION CONTROL PLAN

2. DRL No.:

023

3. References:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 9.2
General Interface Requirements Document (422-11-12-01), Sect. 7.0

4. Use:

Provide an integrated contamination control plan:

a. To define level of cleanliness and methods/procedures to be followed to achieve adequate cleanliness/contamination control; and

b. To define the approach required to maintain cleanliness/contamination control through shipping, observatory integration test, and flight.

5. Related Documents:

DRL # 016, 020, 029, 032, 406

6. Preparation Information:

a. Pre-flight

1. Define the methods, procedures, and schedule requirements for contamination control during the integration of the instrument at the observatory level.

2. Define methods for determining a budget for allowable accretions for each phase of the program. Define a contamination allowance for performance degradation of contamination sensitive hardware such that, even in the degraded state, the hardware will meet its mission objectives.

3. Define levels of cleanliness and methods/procedures to be followed for this Project, from start of contract to end of mission, referencing all analyses to be

performed to assess instrument sensitivity and to define requirements. Show that these methods/procedures are in consonance with the EOS GIRD (422-11-12-01) and the MLS UIID requirements.

4. Identify critical fabrication and assembly activities which will be performed in clean rooms or in clean room benches at the 100,000 or 10,000 class level or NHB 5340.2. Provide an integrated operations flow chart.

5. Identify the controls over atmospheric contaminants, temperature, and humidity which will be used during electronic fabrication (including soldering), integration, testing, transportation, and launch. Indicate how others' controls will meet the requirements, including a description of all facilities that will be used.

6. Identify cleaning, inspection, and gaffing to be used for parts, flight subassemblies, and the assembled instrument. Identify how others' activities will meet the requirements, and reference the procedures used for these activities.

7. Identify design features of shipping containers which will keep contamination on flight hardware during shipping and storage within the contamination budget.

8. Define the requirements and methods/procedures required to maintain cleanliness during instrument fabrication, integration, and test.

9. Show that the efforts to control contamination are consistent with controls to prevent electrostatic damage.

10. Indicate the methods and frequency for monitoring cleanliness levels and accretions to ensure compliance with requirements.

11. Define criteria for materials selection and acceptance relative to contamination control.

12. Specify criteria for bake-out of critical subsystems and the instrument.

13. Provide a contamination training program. All personnel required to work in clean areas with flight hardware must be trained to work according to clean area procedures.

14. Define overall vent location and orientation policy, indicating how unintentional venting shall be avoided. (All applicable drawings should show vent locations that comply with venting analysis.)

b. Flight

1. Define the design requirements and design approach for contamination control on orbit.

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

PRE-ENVIRONMENTAL REVIEW (PER) DATA PACKAGE

2. DRL No.:

029

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01), Para. 5.1
EOS Configuration Management Plan (420-02-02), Figure 3-1
Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 2.2, 2.3
EOS Chemistry and Special Flights Instrument Software Requirement Management Document, (424-28-11-01), Table 4-1

4. Use:

Presents the description and expected results for the Test and Calibration program for hardware and software.

5. Related Documents:

DRL #016, 018, 020, 022, 023, 032, 209, 307, 308

6. Preparation Information:

This review package shall be prepared in accordance with the MAR for TES and MLS (424-11-13-02) and shall include, as a minimum:

a. Agenda;
b. copies of responses to action items and recommendations generated at prior reviews;
c. presentation material (e.g., viewgraph copies) for the subject review;
d. analyses and reports required at the review;
e. supportive material - Where supportive material has been submitted prior to or concurrent with this requirement, such material may be incorporated within this requirement by reference.
f. test and integration program descriptions and results;
g. failure report summaries including status of action and rationale for closure; and
h. as-built documentation summary.

The action items with responses shall also be submitted.

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:	2. DRL No.:
PRE-SHIP REVIEW (PSR) DATA PACKAGE	032

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-246-01), Para. 5.1
EOS Configuration Management Plan (420-02-02), Figure 3-1
Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 2.2, 2.3
EOS Chemistry and Special Flights Instrument Software Management Requirements Document, (424-28-11-01), Table 4-1

4. Use:

For review of all test data, including hardware and software, for compliance against specification requirements, variances, mission operations requirements, etc.

5. Related Documents:

DRL #016, 020, 029, 209, 303, 307, 405, 406,

6. Preparation Information:

This data package shall address, as a minimum:

a. Agenda;
b. copies of responses to action items and recommendations generated at prior reviews;
c. presentation material (e.g., viewgraph copies) for the subject review;
d. analyses and reports required at the review;
e. supportive material - Where supportive material has been submitted prior to or concurrent with this requirement, such material may be incorporated within this requirement by reference;
f. results of the functional and interface tests;
g. malfunctions and corrective actions, including but not limited to red flag items;
h. failure report summaries including status of action and rationale for closure;

j. comparison of measured performance with requirements and discussion of the effect of any variance and waivers;
k. mission operation constraints;
l. contamination avoidance requirements;
m. safety requirements;
n. maintenance and operation manuals;
o. spares for flight equipment and GSE;
p. GSE maintenance service contracts;
q. review of instrument handling procedures;
r. interface concerns, problems and solutions;
s. plans for integration with the spacecraft;
t. status of launch site preparation activities;
u. orbital operations plans;
v. end-item data packages (submit a summary of the content prior to review and have package available for inspection at review);
w. compatibility of instrument with observatory flight support equipment, ground support equipment and operational ground equipment.
x. number of continuous trouble-free hours of instrument operation;
y. accumulated operating hours on instrument, subsystems, and spares; and
z. identify any open items.

The minutes and results of this review, with action items and responses, shall also be submitted.

This shall be submitted in accordance with Part B (0XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

STRUCTURAL MATH MODEL

2. DRL No.:

102

3. Reference:

EOS General Interface Requirements Document (422-11-12-01), Para. 3.7, Section 11.1
EOS Calibration Management Plan (420-03-01), Para. 3.0

4. Use:

For providing instrument interface information to be utilized in various statics and dynamics observatory analyses.

5. Related Documents:

DRL #016, 020, 103

6. Preparation Information:

The deliverable MLS Structural Math Model shall meet all requirements listed in Section 11 of the General Interface Requirements Document (422-11-12-01). In addition to these requirements, the math model shall be compared with a modal survey carried out on the Flight model to verify frequency and mode shape predictions of the structural math model. The frequency predictions should agree with the modal survey results to within 5 percent for the first mode and 10 percent for all other significant modes up to 100 Hz. In addition to the frequency correlation, the mode shape correlations between test and the analytical model shall include a cross-orthogonality check, a mode shape geometric similarity check, and a static deflection check. The final update of the structural model shall include any modifications required to correlate the model to the physical test results.

This shall be submitted in accordance with Part B (1XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

THERMAL MATH MODEL

2. DRL No.:

103

3. Reference:

EOS Calibration Management Plan (420-03-01), Para. 3.0
EOS General Interface Requirements Document (422-11-12-01) Section 4.7, Section 11.2

4. Use:

To evaluate the thermal performance of the instrument.

5. Related Documents:

DRL #016, 020, 102

6. Preparation Information:

The model shall be composed of at least 250 nodes. The Thermal Math Model shall have sufficient detail of all subsystems and critical interfaces to accurately predict absolute interfaces. These models shall be verified and refined after comparison with thermal test data.

SINDA-compatible and TRASYS-compatible reduce-node versions of the full instrument thermal math model, appropriately documented, are required for analytical integration with the spacecraft. A users guide shall be provided for deliverable math models.

This shall be submitted in accordance with Part B (1XX series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

OPERATIONS HAZARDS ANALYSES

2. DRL No.:

107

3. Reference:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 11.4.2

4. Use:

Provides analyses of systems hazards related to JPL operations.

5. Related Documents:

DRL #020, 022, 029, 032, 307, 308, 406,

6. Preparation Information:

Performance of an Operations Hazard Analysis (OHA) shall consider the following:

a. Planned configuration at each phase of activity;
b. supporting tools or other equipment specified for use;
c. operational/task sequence, concurrent task effects and limitations;
d. biotechnological factors, regulatory or contractually specified personnel safety and health requirements; and
e. potential and unplanned events including hazards introduced by human errors.

The OHA shall be used to identify hazardous operations and tasks, the hazardous conditions associated with the tasks, the causes of the hazardous conditions, the risks associated with the hazardous conditions, and recommendations to eliminate or reduce the effects of the hazardous conditions.

The required data for an OHA are drawings, specifications, timeliness, procedures, schematics, and hazard analysis of the flight and ground support equipment involved in the operation being analyzed.

The OHA shall be initiated as soon as practicable in the development phase of the Project.

The JPL shall perform the following:

a. Identify all hazardous conditions during testing and ground operations;
b. establish requirements for special equipment, skills, or training;
c. establish cautions and warnings in procedures;
d. detail the proper sequence of tasks to be performed; and
e. identify additional safeguards or procedure changes, as necessary.

These shall be submitted in accordance with Part B (1XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

MALFUNCTION/FAILURE REPORTS

2. DRL No.:

209

3. Reference:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 8.1.1

4. Use:

Provides reporting, monitoring, and closure of all system level malfunctions and failures and their corrective actions for the MLS instrument.

5. Related Documents:

DRL #029, 032

6. Preparation Information:

These reports provide all information required to adequately identify and track subsequent actions relative to any failure or malfunction. Each iteration shall contain the items of information listed on GSFC Form 4-2 or JPL equivalent as pertinent to the update iteration being submitted.

Pre-Instrument Integration: Reporting shall begin when the design is frozen (normally at CDR). Oral notification of a malfunction or failure to the GSFC MLS Instrument Manager and/or the System Assurance Manager shall occur within 3 days of the malfunction/failure.

Post-Instrument Integration (after Pre-Environmental Review): Reporting shall begin after Pre-Environmental Review and before any system level tests are performed. Oral notification of a malfunction or failure to the GSFC MLS Instrument Manager and/or the System Assurance Manager shall occur within 24 hours of the malfunction/failure. Oral notification shall be followed by written notification within 3 days following the malfunction/failure (electronic medium is encouraged).

GSFC and JPL shall participate in the analysis, assignment of corrective actions, and closure process for all post-instrument integration malfunctions/failures. GSFC shall

respond to all proposed closures within 24 hours of JPL's notification of proposed closure. If a response from GSFC is not received within that time, approval shall be assumed by the JPL.

These shall be submitted in accordance with Part B (2XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

SAFETY COMPLIANCE DATA PACKAGE

2. DRL No.:

224

3. Reference:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Section 11

4. Use:

Provides data in conjunction with risk assessment. Provides evidence to the launch facility organization of the safety readiness of the observatory (including Instruments) for processing and launch.

5. Related Documents:

DRL #016, 020, 032, 526

6. Preparation Information:

This package shall be prepared in accordance with the MAR for TES and MLS (424-11-13-02) and the requirements of WRR 127-1 for an "Accidental Risk Assessment Report".

This package shall be submitted in accordance with Part B (2XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:	2. DRL No.;
COMMAND AND TELEMETRY HANDBOOK	303

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01)
General Interface Requirements Document (422-11-12-01), Para. 6.5, 8.1
Instrument Software Management Requirements Document (424-28-11-01)

4. Use:

For determining the commands required for instrument operation, and definition of all instrument telemetry data.

5. Related Documents:

DRL #016, 032, 306, 405

6. Preparation Information:

This handbook shall include a definition of software interfaces. It shall contain a complete list of instrument commands for all instrument modes of operation and sequence testing with a description of their effects, and it shall identify any critical commands which may damage the instrument in certain situations. It shall contain a complete list of engineering telemetry data coming from the instrument, including engineering telemetry calibrations, the levels or responses expected in response to commands, and levels which require alerts or immediate actions.

This shall be submitted in accordance with Part B (3XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title: OPERATION AND MAINTENANCE MANUALS

2. DRL No.: 307

3. Reference:

4. Use:

For operating and servicing MLS and its IGSE.

5. Related Documents:

DRL #029, 032,
EOS General Interface Requirements Document (422-11-12-01)

6. Preparation Information:

Operation and maintenance manuals shall be prepared for the Protoflight Model and for all IGSE. As a minimum these manuals shall contain the system and subsystem description, function and operation, block diagrams and circuitry description, operation and test procedures, maintenance, and performance data. These manuals, in conjunction with the approved drawings, shall provide all the information needed for operating and servicing the MLS and its IGSE.

These manuals shall be submitted in accordance with Part B (3XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:	2. DRL No.:
PERFORMANCE VERIFICATION SPECIFICATION	308

3. Reference:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 3.2.4

4. Use:

Provide technical requirements and approach for demonstrating that each hardware item complies with its performance requirements.

5. Related Documents:

DRL #020, 022, 107, 406

6. Preparation Information:

This specification shall incorporate the requirements of the MAR for TES and MLS (424-11-13-02). For the instrument, its components, and its assemblies, the specifications shall be compatible with, and inclusive of, all elements of the matrices required in DRL #022, "Performance Verification Plan."

The specifications should clearly indicate the relationship to hardware maturity, such as qualification and acceptance. For multiple identical items, indicate the specifications that apply to each.

This specification shall include, as a minimum:

a. Environmental test specification requirements

- standard conditions for all test areas (temperature, humidity, cleanliness)
- qualification and acceptance test temperatures (includes uncertainties)
- shock test requirements
- radiation levels

- acoustic excitation levels
- qualification and acceptance vibration test levels
- electromagnetic test levels;

b. thermal and thermal vacuum test profiles for all components and subsystems in MLS;

c. instrument-level thermal balance and thermal test profiles;

d. estimated test run time for each event;

e. performance parameter accept/reject criteria; and

f. measurement tolerances for weight, center-of-gravity and moments-of-inertia.

This shall be submitted in accordance with Part B (3XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

GENERAL OPERATING COMMAND PROCEDURES

2. DRL No.:

405

3. Reference:

General Interface Requirements Document (422-11-12-01), Para. 6.1, 6.5

4. Use:

For configuring MLS in its operational modes.

5. Related Documents:

DRL #016, 020, 032, 303

6. Preparation Information:

These procedures shall describe command sequences necessary to configure the instrument in any phase of any operational mode described in the specifications.

These procedures shall be submitted in accordance with Part B (4XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

TRANSPORTATION AND HANDLING PROCEDURES

2. DRL No.:

406

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01)
Mission Assurance Requirements for TES and MLS (424-11-13-02)
EOS General Instrument Requirements Document (422-12-11-02)

4. Use:

Provide the instructions and procedures for safe and effective off-site transporting and handling of MLS and associated IGSE throughout the mission development.

5. Related Documents:

DRL #020, 022, 029, 032

6. Preparation Information:

This documentation shall discuss all of the step-by-step procedures for the handling and transporting of MLS, spares, and IGSE. The documentation shall include:

a. Nomenclature of all supportive equipment;
b. calibration and load-tested data;
c. identification of special environmental conditions, such as cleanliness, temperature, humidity, etc., and the controls to be implemented to maintain those conditions;
d. format for recording QA stamp, deviations and approval columns;
e. requirements for special tools, equipment, special handling fixture and containers;
f. method of transportation and carrier;
g. procedures to comply with local, state and federal safety requirements; and
h. procedures for maintaining contact with the transported item (where applicable).

These shall be submitted in accordance with Part B (4XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title: PROJECT MANAGEMENT REPORT

2. DRL No.: 501

3. Reference:

Phase C/D Working Agreement for the MLS (424-28-24-01), Para.5.2

4. Use:

Provides a monthly update of technical and financial status.

5. Related Documents:

DRL #522

6. Preparation Information:

The Project Management Reports shall include, at a minimum, the following:

1) Technical status;
2) Project performance metrics;
3) Schedule status based on a detailed logic network schedule (Working Agreement, para. 8.2) including milestone completion, schedule slack, and critical path analyses;
4) Financial status including funds provided versus actual obligations and costs from inception;
5) Obligation status including planned funding, actual funding, variances, reserves, and liens;
6) Cost status including planned expenditures, actual expenditures, variances, and earned values;
7) Financial variance explanation and analysis;
8) Workforce status including planned workforce, actual workforce, and variances;
9) Workforce variance explanation and analysis;
10) Reliability, safety, and mission assurance status and issues, including but not limited to activities regarding parts and materials qualifications, requests, waivers, and malfunction reports;
11) Weight, power, and data rate budgets;

12) Top level JPL Performance Measurement System report; and
13) Reliability and Mission Assurance issues,.

These shall be submitted in accordance with Part B (4XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

WAIVER/DEVIATION REQUESTS (CLASS 1)

2. DRL No.:

510

3. Reference:

Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 11.8, 10.1, Section 8
EOS Configuration Management Plan (420-02-02), Para. 4.7

4. Use:

Provides for the submission of waiver/deviation requests to GSFC for any repair or use-as-is recommendations that might adversely affect the safety, reliability, durability, performance, interchangeability, weight, etc. of the hardware.

5. Related Documents:

DRL #016, 020, 512

6. Preparation Information:

These shall be prepared in accordance with the MAR for TES and MLS (424-11-13-02).

Submit waiver and deviation requests to the Project in accordance with the EOS Configuration Management Plan (420-02-02) and Part B (5XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

CONFIGURATION CHANGE REQUESTS (CLASS 1)

2. DRL No.:

512

3. Reference:

EOS Configuration Management Plan (420-02-02) Figure 4.2.1, Para. 4.2.1, 4.3.1
EOS Chemistry and Special Flights Project Instrument Software Management Requirements Document (424-28-11-01)
Mission Assurance Requirements for TES and MLS (424-11-13-02), Para. 10.1, Section 8

4. Use:

Class I changes are to be used as a vehicle for orderly processing of change requests to the appropriate level of approval authority for disposition. Class II changes are to be used as a vehicle for processing of all change requests not classified as Class I to the appropriate levels for concurrence.

5. Related Documents:

DRL #510

6. Preparation Information:

Consistent with the Configuration Management Plan (CMP), JPL shall prepare Class I Change Requests for all changes that may impact form, fit, function, cost, schedules, or performance. These changes shall be processed according to the procedures outlined in the CMP and shall be reviewed and approved by appropriate levels of the Configuration Control Board (CCB).

These shall be submitted in accordance with Part B (5XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

PHOTOGRAPHIC RECORDS

2. DRL No.:

522

3. Reference:

None

4. Use:

Program status reviews; system, subsystem, and component packaging evaluations, and trouble shooting.

5. Related Documents:

None

6. Preparation Information:

a. Still Photography

Pictures shall be made at appropriate points in the development of MLS. Pictures shall be made of the major subsystems, critical components, the full-up system, and major IGSE items. These pictures shall be in color and measure 8 X 10 inches. The pictures shall serve as a record of the build-up of a major component or subsystem; e.g., a typical electronic card, mother board, electronic subsystem with cover off, etc. Pictures of environmental test fixtures shall also be provided. Hard copies and negatives of each picture shall be provided. JPL should plan on at least 50 pictures of individual items, and 2 copies of each item except for the full-up system which shall require 10 copies each of the protoflight model and the Engineering model.

b. Motion Picture Photography

½" VHS format
**Minimum TBD feet, Maximum TBD feet

DESCRIPTION OF REQUIRED DATA

1. Title:

ACCEPTANCE DATA PACKAGE

2. DRL No.:

526

3. Reference:
Phase C/D Working Agreement for the MLS (424-28-24-01), Para. 7.2

4. Use:

To ensure that the deliverable end-items are in accordance with the Working Agreement requirements prior to NASA acceptance.

5. Related Documents:

DRL #032

6. Preparation Information:

This acceptance data package shall be comprised of the following, as a minimum:

a. As-built configuration list;
b. hardware parts lists;
c. hardware materials lists;
d. Test Log Book (including total operating time and cycle records);
e. open item lists (including reasons for being open);
f. safety compliance data package;
g. limited life items listings and status;
h. critical parameters trend data;
i. final comprehensive performance test results;
j. As-built instrument level drawings with index and complete drawing tree; and
k. software acceptance test results.

This acceptance data package shall be submitted in accordance with Part B (5XX Series) of this document with an additional copy accompanying each end-item.

DESCRIPTION OF REQUIRED DATA

1. Title:

ALGORITHM THEORETICAL BASIS DOCUMENT

2. DRL No.:

601

3. Reference:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

To provide the theoretical basis for the algorithm used to generate each standard data product.

5. Related Documents:

DRL #008, 018

6. Preparation Information:

The document defines and describes in detail the algorithm that processes the instrument data into the basic hierarchical data format granule data storage structure (a level 1B/2A, 3 data product), and should address the following:

a. Theoretical basis of the instrument data processing algorithm;
b. detailed description of the data processing algorithm;
c. walk through of the data processing scenario; and
d. constraints limitation and assumptions associated with the instrument data processing algorithm.

An ATBD shall be provided for each standard data produce and these shall be submitted in accordance with Part B (6XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

SCIENCE DATA VALIDATION PLAN

2. DRL No.:

604

3. Reference:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

To describe, coordinate, and direct the validation of scientific data generated from the MLS Instrument, in conjunction with the overall EOS Data Validation activities, and in accordance with the team's scientific investigation objectives and EOS Level I Requirements.

5. Related Documents:

N/A

6. Preparation Information:

The plan shall:

a. Describe the algorithm validation approach which addresses the scientific validity of the algorithms as opposed to the ability of the programs to run to completion correctly;

b. describe how the accuracy, precision and resolution will be confirmed;

c. list those EOS and non-EOS experimental activities that are required for the MLS validation effort;

d. list those operational measurements that are required for the instrument validation; and

e. describe the format of the post-launch Science Data Validation Report which shall be generated to document the results of the post-launch data validation activities.

DESCRIPTION OF REQUIRED DATA

1. Title:

SCIENTIFIC PUBLICATIONS

2. DRL No.:

605

3. References:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

The results of the MLS scientific investigations will be published in the proceedings of scientific meetings and refereed scientific journals. Copies of the publications will be maintained at GSFC.

5. Related Documents:

None

6. Preparation Information:

Each publication resulting from work supported by NASA EOS Program funding shall contain a citation identifying the NASA EOS Program.

A copy of each publication shall be provided to the EOS Project Science Office and to the MLS Instrument Manager in the EOS Chemistry Project.

This shall be submitted in accordance with Part B (6XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

SCIENCE REQUIREMENTS DOCUMENT

2. DRL No.:

606

3. References:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

Provides the scientific objectives of the experiment.

5. Related Documents:

None

6. Preparation Information:

The plan shall be prepared in accordance with the Science and Flight Operations Working Agreement (424-28-24-07)

This shall be submitted in accordance with Part B (6XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

SCIENCE DATA MANAGEMENT PLAN

2. DRL No.:

608

3. References:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

To determine the data management functions between the JPL and the ESDIS Project. Identifies format and content involved in data generation and data validation.

5. Related Documents:

None

6. Preparation Information:

The plan shall be prepared in accordance with the Science and Flight Operations Working Agreement (424-28-24-07)

This shall be submitted in accordance with Part B (6XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title:

INSTRUMENT OPERATIONS SUPPORT PLAN

2. DRL No.:

609

3. Reference:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

To describe the planning, scheduling, commanding and monitoring for all instrument activities on-orbit.

5. Related Documents:

DRL #008, 018, 022, 023, 303, 307, 405, 604

6. Preparation Information:

The plan shall be prepared in accordance with the Science and Flight Operations Working Agreement (424-28-24-07)

This shall be submitted in accordance with Part B (6XX Series) of this document.

DESCRIPTION OF REQUIRED DATA

1. Title: SCIENCE COMPUTING FACILITY PLAN

2. DRL No.: 610

3. References:

MLS Science and Flight Operations Working Agreement (424-28-24-07)

4. Use:

To identify responsibilities with respect to external interfaces of the SCF. To identify the plans for the procurement, management, operations, and maintenance of the SCF.

5. Related Documents:

None

6. Preparation Information:

The plan shall be prepared in accordance with the MLS Science and Flight Operations Working Agreement (424-28-24-07)

This shall be submitted in accordance with Part B (6XX Series) of this document.